

EXPERIMENTAL TELEVISION CENTER LTD.
164 COURT ST.
BINGHAMTON NEW YORK 13901
607-723-9509

A Computer-Based Video Synthesizer System

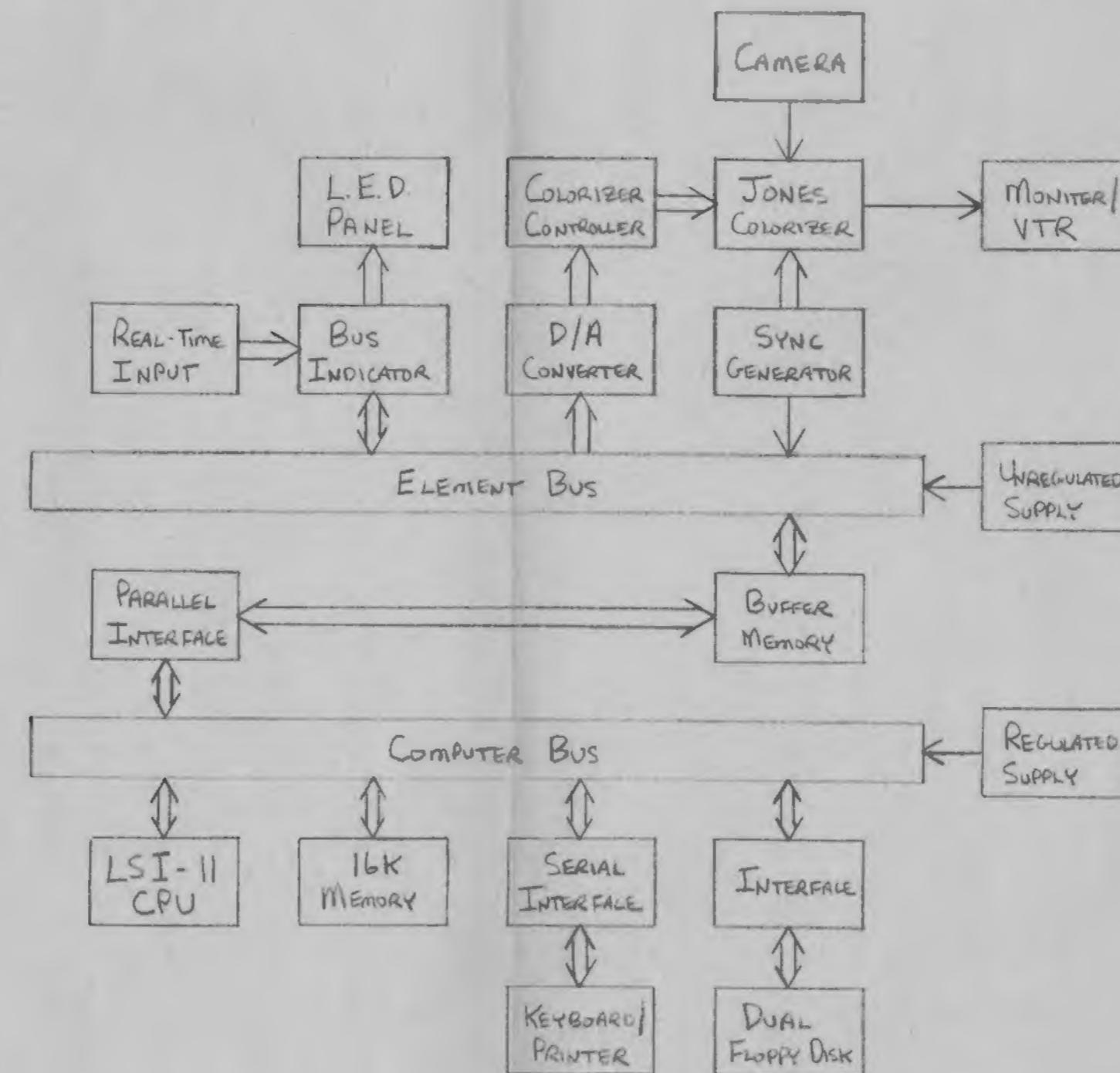
Hardware Documentation

Richard Brewster

Experimental Television Center Ltd.
Binghamton, New York

This project is supported in part by the National Endowment for the Arts and
the New York State Council on the Arts.

EXPERIMENTAL TV CENTER, LTD.
BINGHAMTON, N.Y.
COMPUTER - BASED
PROCESSING VIDEO SYNTHESIZER
SYSTEM DIAGRAM, 9/77 R.B.



EXPERIMENTAL TV CENTER, LTD
BINGHAMTON, N.Y.
COMPUTER PROJECT
ELEMENT BUSS POWER SUPPLY
6/77 RICH BREWSTER
PAGE 1 OF 1

PARTS LIST :

TRANSFORMER - BASLER BE12696-00

2 BRIDGE RECTIFIERS 200 PIV 12A

1 BRIDGE RECTIFIER 400 PIV 25Amp

3 Chokes, 20 Amp, $\leq .05$ ohm

4 CAPACITORS, 3700 MFD AT 75V

2 CAPACITORS, 10800 MFD AT 201

3 RESISTORS, 2000 ohm 1/2 WATT

1 FUSE HOLDER w/ 1AMP Slow-Blo FUSE

3 CAPACITORS, .01 mfd 100V MYLA

3 CAPACITORS .1 mFD 600V

1 NEON PILOT LAMP ASSEMBLY

1 S.P.S.T. Toggle Switch, 6

1 LINE CORD, 3 WIRE, 120V

1 CINCH-JONES CONNECTOR, 6 PIN

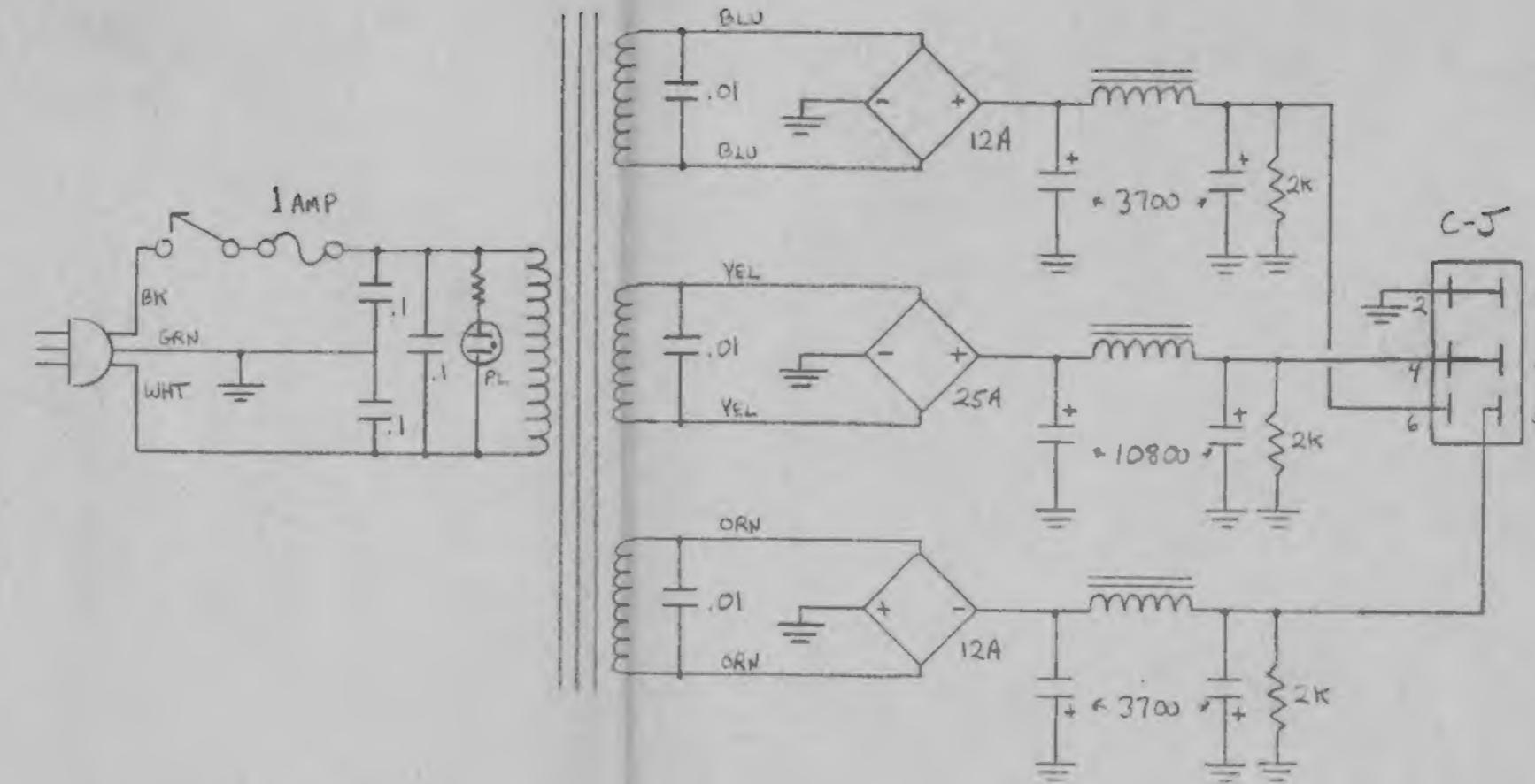
CHASSIS MOUNTED FEMALE

CABLE PARTS:

1 C-J MALE, CABLE MOUNT, 6 PIN

1 C-J FEMALE, CABLE MOUNT, 6 PIN

10' 7-CONDUCTOR, 18 GAUGE CABLE



CONNECTOR, CABLE, VOLTAGE, CURRENT

1,2	BLK, GRN, BRN	GND	
3,4	WHT, RED	+9V	(
5	BLU "	-19V	:
6	ORN "	+19V	:

* NOTE - THESE ARE THE CABLE COLORS,
THE TRANSFORMER LEADS WHICH HAPPEN
BE THE OPPOSITE COLORS.

ELEMENT BUS

1	+9V	51	+9V
2	+9V	52	-19V
3	XRDY	53	<u>SSW DSB</u>
4	<u>Q1</u>	54	<u>EXT CLR</u>
5	<u>Q2</u>	55	
6	<u>Q3</u>	56	BYTE
7	<u>ETF</u>	57	DI08
8	<u>CEM</u>	58	DI09
9	<u>CME</u>	59	DI010
10	<u>FTE</u>	60	DI011
11	<u>TR</u>	61	DI012
12	X CLOCK	62	DI013
13	X LOAD	63	DI014
14	Y CLOCK	64	DI015
15	Y LOAD	65	
16	HDTTL	66	SCTTL
17	VDSYNC	67	
18	<u>STA DSB</u>	68	MWRT
19	<u>QC DSB</u>	69	PS
20	UNPROT	70	PROT
21	SS	71	RUN
22	<u>ADD DSB</u>	72	PRDY
23	<u>DO DSB</u>	73	PINT
24	<u>Q2</u>	74	FHOLD
25	<u>Q1</u>	75	PRESET
26	PHLDA	76	PSYNC
27	PWAIT	77	WE
28	PINTE	78	RE
29	A5	79	A0
30	A4	80	A1
31	A3	81	A2
32	A15	82	A6
33	A12	83	A7
34	A9	84	A8
35	D1	85	A13
36	D0	86	A14
37	A10	87	A11
38	D4	88	D2
39	D5	89	D3
40	D6	90	D7
41	DI2	91	DI4
42	DI3	92	DI5
43	DI7	93	DI6
44	SM1	94	DI1
45	SOUT	95	DI0
46	SINP	96	SINTA
47	SMEMR	97	SWO
48	SHLTA	98	SSTACK
49	<u>CLOCK</u>	99	POC
50	GND	100	GND

DON SIGNALS

<u>Q1</u>	{ From BUFFER MEMORY
<u>Q2</u>	
<u>Q3</u>	
<u>CEM</u>	
<u>CME</u>	{ From BUS INDICATOR
<u>ETF</u>	
<u>FTE</u>	
<u>TR</u>	
YD SYNC	
A0 - A9	
D0 - D7	
DI08 - DI015	

JEFF SIGNALS

X CLOCK
X LOAD
Y CLOCK
Y LOAD
HDTTL
SCTTL
<u>WE (PWR)</u>
<u>RE (INVERSE PDBIN)</u>
BYTE

NOTES

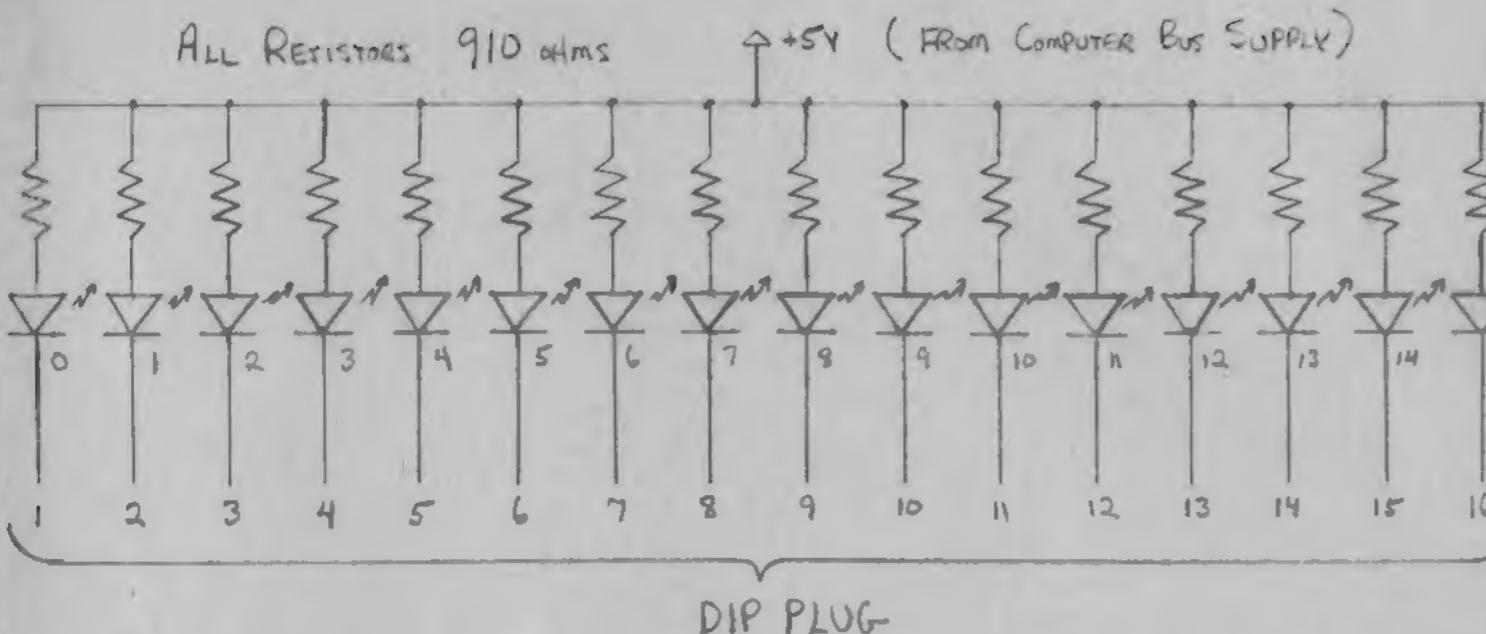
- ① PIN 17 CARRIES NEGATIVE GOING V.D.,
TR IS THE SAME AS VDTTL.
- ② D0 - D7 ARE DATA OUT FOR ALTAIR, AND
DATA IN-OUT FOR DON'S SYSTEM.
- ③ SIGNALS OTHER THAN DON'S OR JEFF'S ARE
TAKEN FROM THE ALTAIR 8800 BUS STRUCTURE.
- ④ PINS 4-11 ARE DESIGNATED "VECTORED
INTERRUPT LINES" IN THE ALTAIR BUS.
- ⑤ Q1 AND Q2 ARE DON SIGNALS THAT ARE
UNRELATED TO Q1 AND Q2 ALTAIR SIGNALS.

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COMPUTER PROJECT 9/77

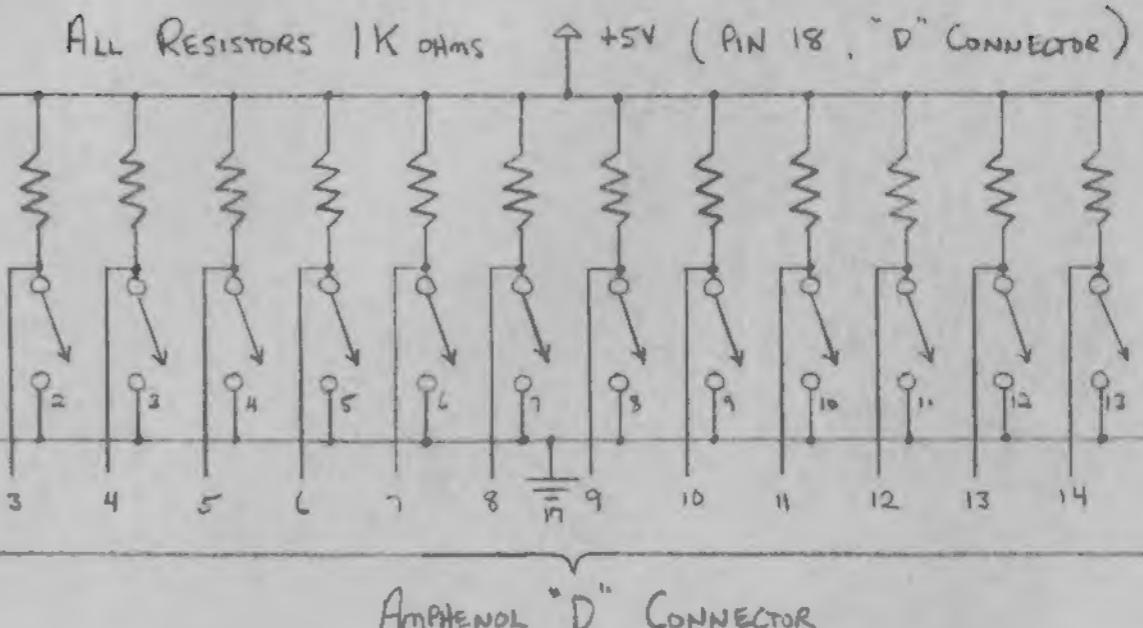
ELEMENT BUS

R.B.

BUS INDICATOR LED PANEL



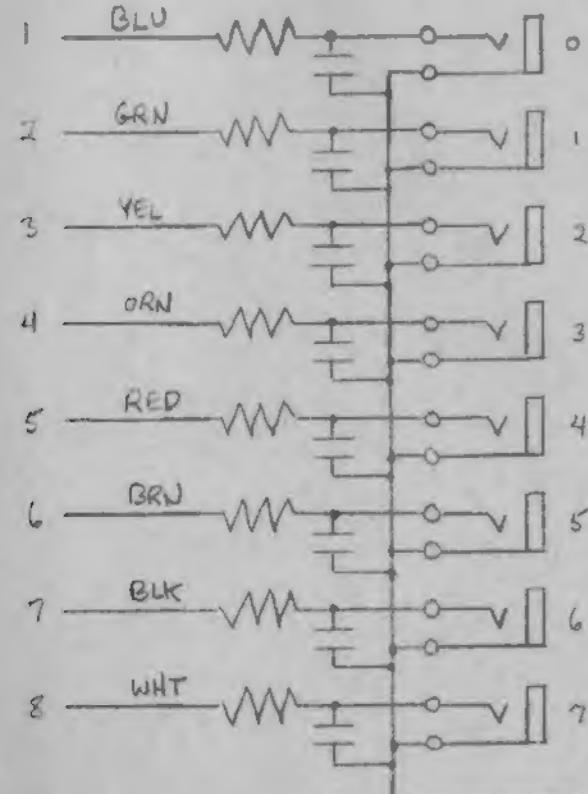
REAL TIME INPUT Box



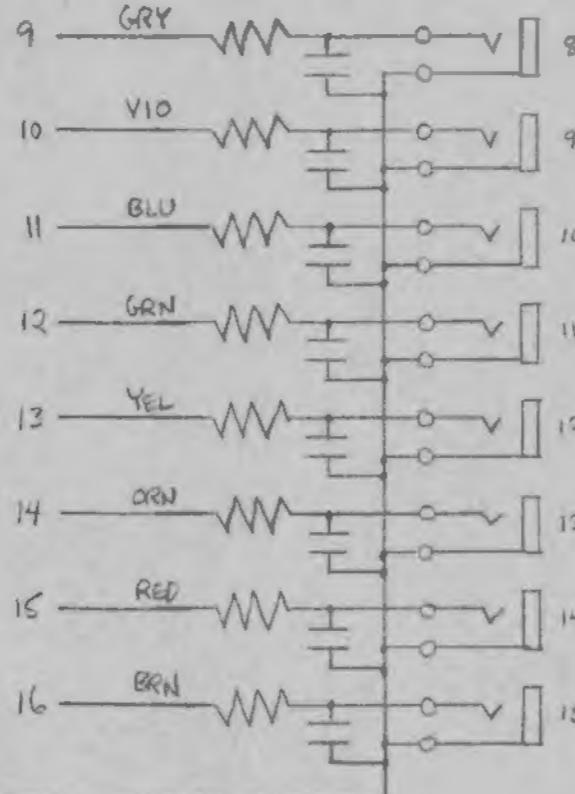
D/A OUTPUT PANEL

(MINIATURE PHONE JACKS)

16-PIN DIP PLUG, ALL RESISTORS 1Kohms

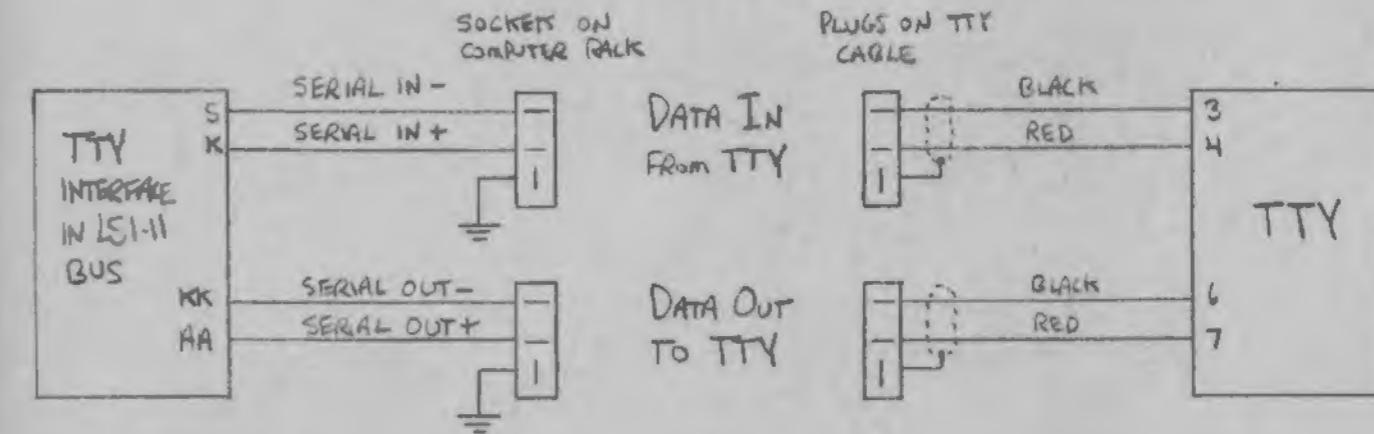


16 PIN DIP PLUG, ALL CAPACITORS .1uf



GROUNDED DIRECTLY TO D/A BOARD

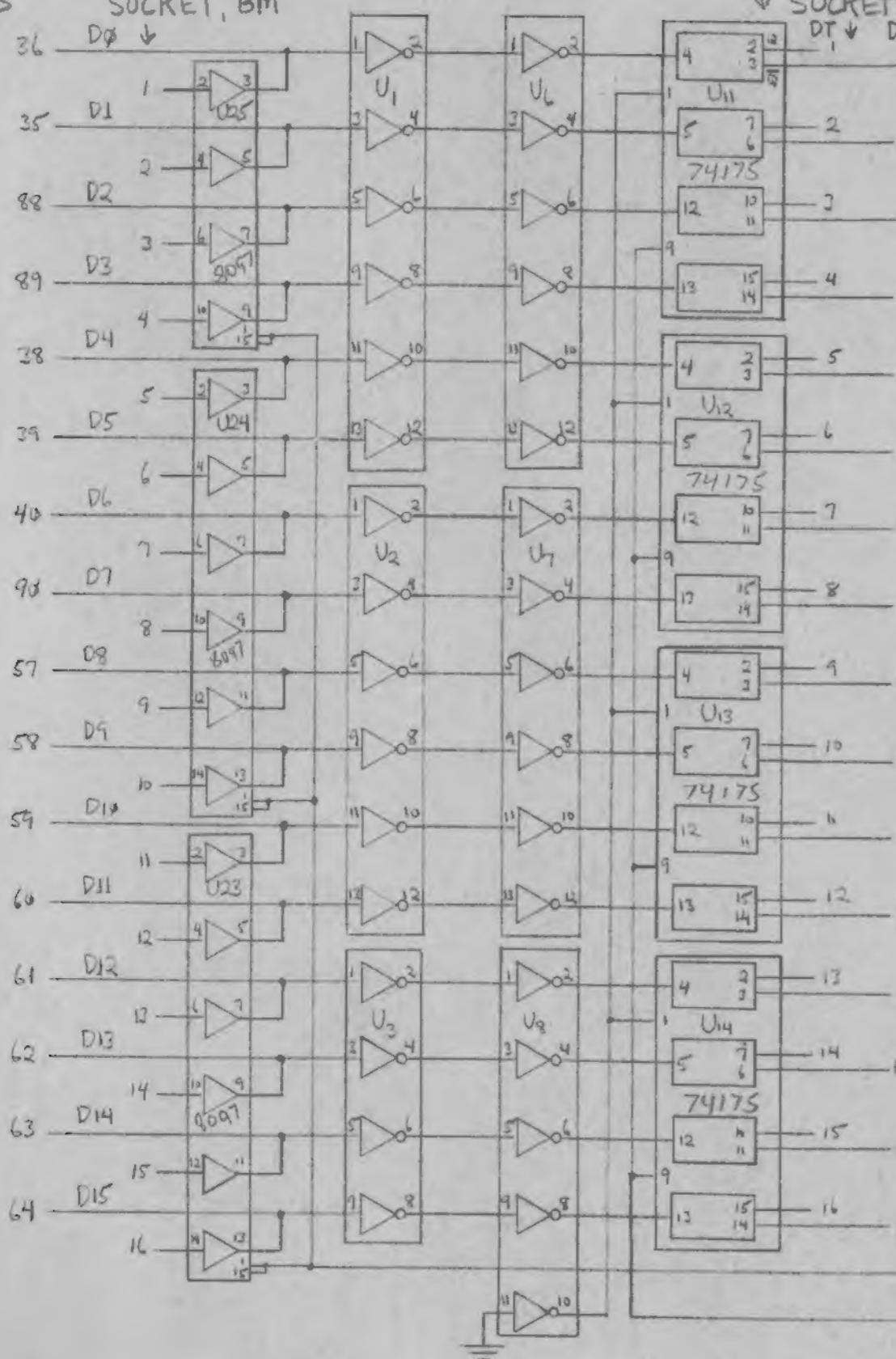
TTY CONNECTIONS



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MISC. RACK WIRING
9/77 R.B.

Q outputs Modified
See other set

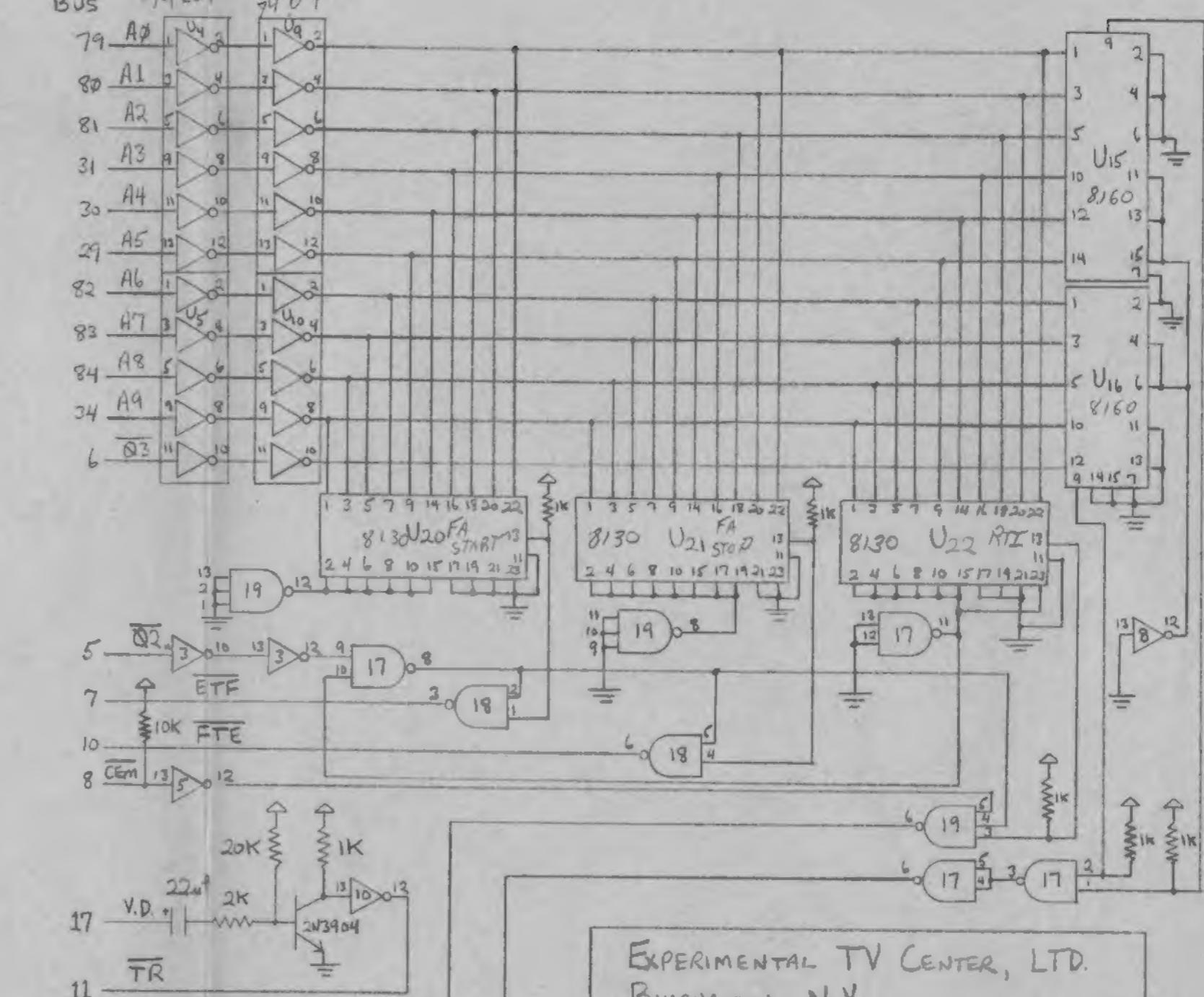
ELEMENT RTI DIP
BUS SOCKET, BM



LED DI
SOCIETE

ELEM

Bus 74104 74



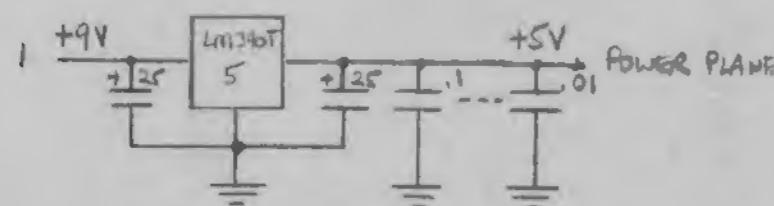
RTI
↑ BIND

$\uparrow = +5VDC$

EXPERIMENTAL TV CENTER, LTD.
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COMPUTER PROJECT:
BUS INDICATOR BOARD, PAGE 1 OF 3
DON MCARTHUR 8/77 R.B.

PARTS LIST

1	VECTOR 8800V UNIVERSAL 100-PIN PLUG-BOARD
12	16-PIN DIP WIRE WRAP SOCKETS
13	14-PIN DIP " " "
3	24-PIN DIP " " "
1	HEAT SINK FOR REGULATOR
1	LM340T-5 REGULATOR
1	2N3904 NPN TRANSISTOR
1	SN7400N QUAD 2-INPUT NAND
1	SN7403N QUAD 2-INPUT NAND, OPEN COLLECTOR
1	SN7410N TRIPLE 3-INPUT NAND
5	SN7404N HEX INVERTER
5	SN74104N HEX INVERTER
4	SN74175N QUAD D FLIP FLOP
3	DM8097N TRI-STATE HEX BUFFER
3	DM8130N 10-BIT COMPARATOR
2	DM8160N 6-BIT COMPARATOR
3	.22uf 25V ELECTROLYTIC CAPACITOR
3	.1uf 35V TANTALUM CAPACITOR
10	.01uf 100V MYLAR CAPACITOR
6	1K 1/4 WATT RESISTOR
1	2K 1/4 WATT RESISTOR
1	20K 1/4 WATT RESISTOR



NUMBER	CHIP	LOCATION	V _{cc} PIN	GND PIN
	U ₁	74L04	AV	14
	U ₂	74L04	AT	14
	U ₃	74L04	AS	14
	U ₄	74L04	AR	14
	U ₅	74L04	AP	14
	U ₆	7404	BV	14
	U ₇	7404	BT	14
	U ₈	7404	BS	14
	U ₉	7404	BR	14
	U ₁₀	7404	BP	14
	U ₁₁	74175	CW	16
	U ₁₂	74175	CV	16
	U ₁₃	74175	CT	16
	U ₁₄	74175	CS	16
	U ₁₅	8160	CR	16
	U ₁₆	8160	CP	16
	U ₁₇	7400	CN	14
	U ₁₈	7403	CM	14
	U ₁₉	7410	CL	14
	U ₂₀	8130	DPN	24
	U ₂₁	8130	DNM	24
	U ₂₂	8130	DML	24
	U ₂₃	8097	AN	16
	U ₂₄	8097	AM	16
	U ₂₅	8097	AL	16

BUFFER MEMORY ADDRESS MAP

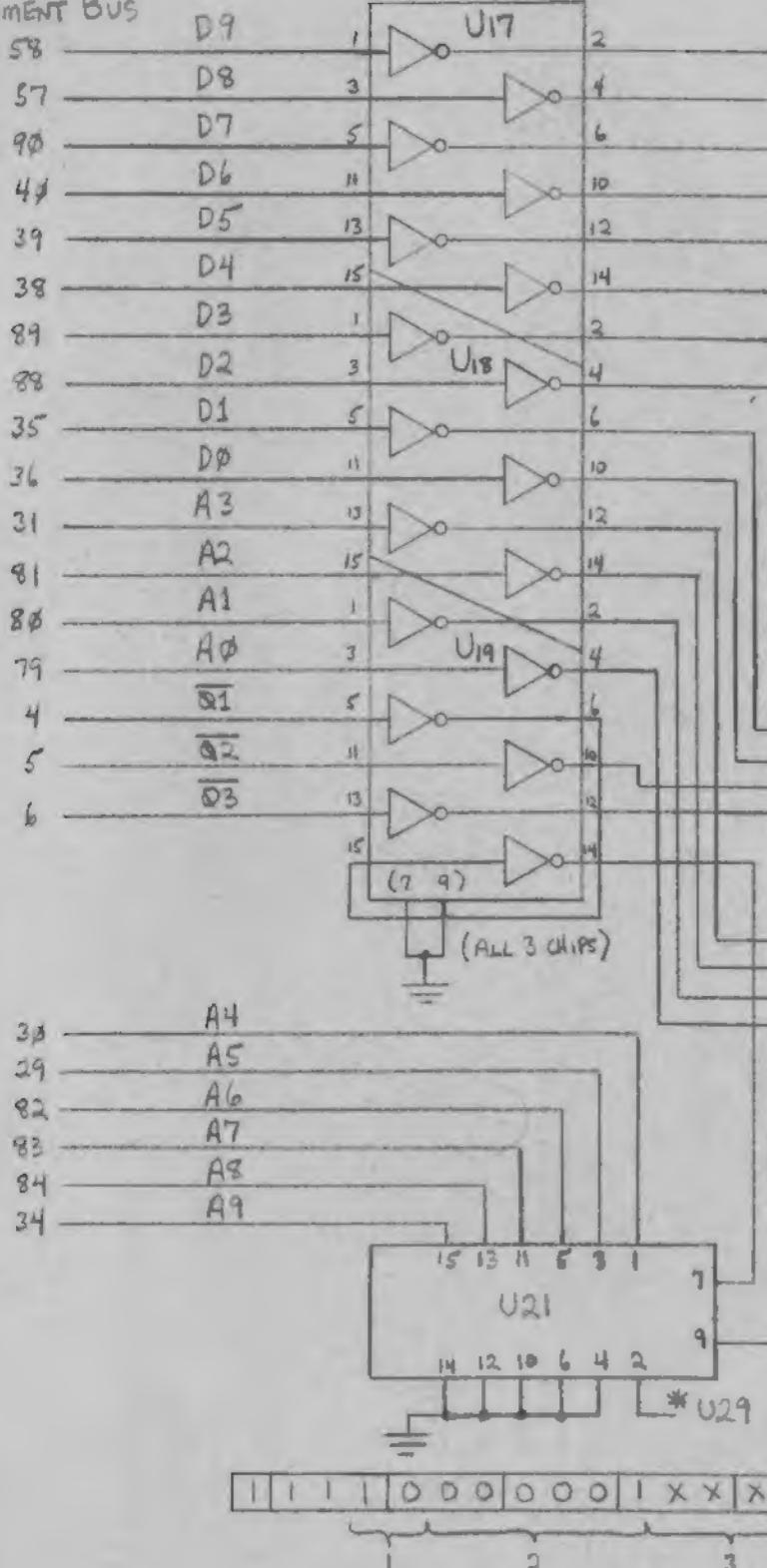
170000	
170040	16 D/A'S
170076	
171560	BUS INDICATOR (U ₁₅ , U ₁₆)
173740	F.A. START (U ₂₀)
173742	REAL TIME INPUT (U ₂₂)
173770	F.A. STOP (U ₂₁)
173776	STATUS REGISTER

THE FOUR CIRCUITS ON THE BUS INDICATOR CARD

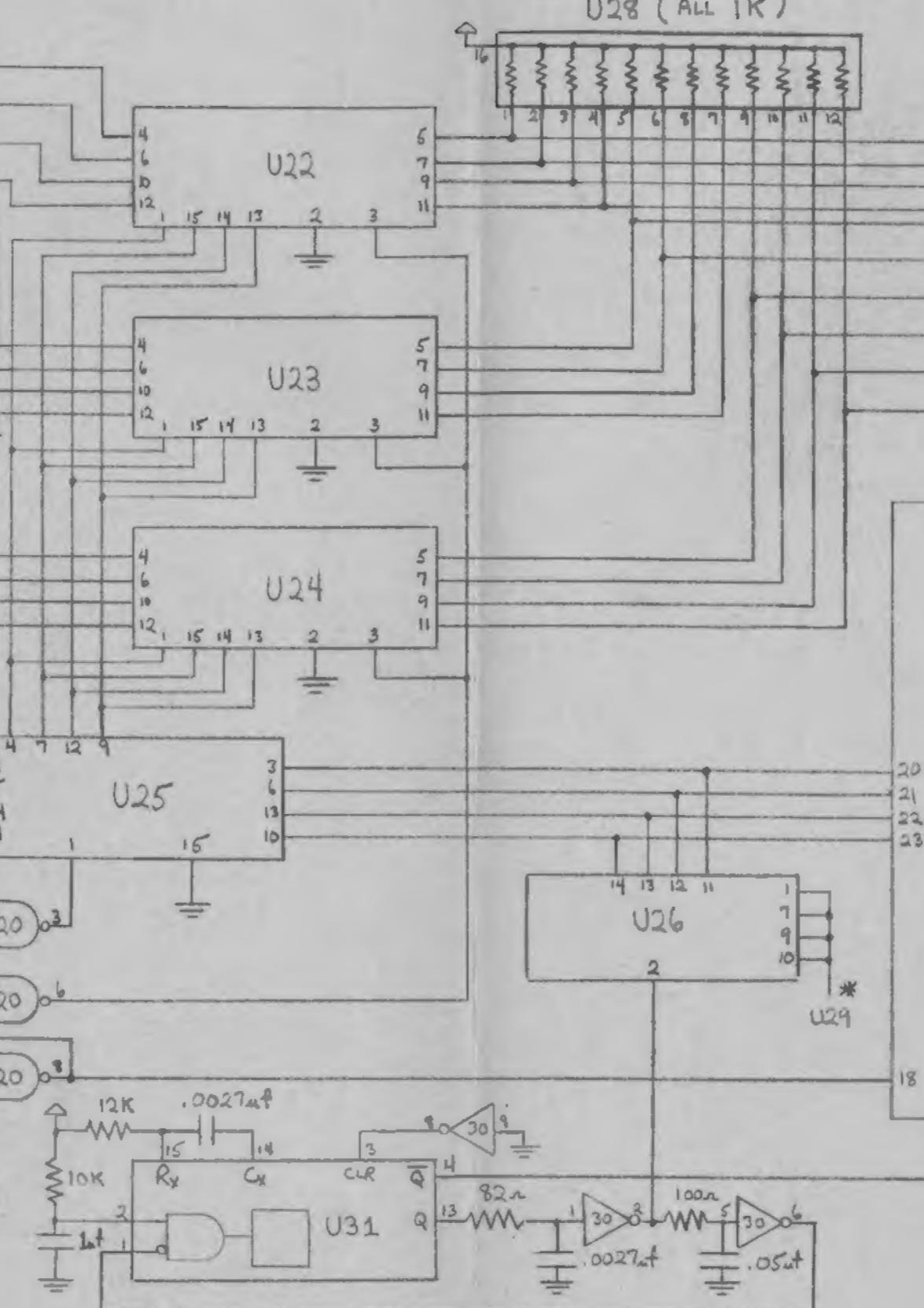
- ① BUS INDICATOR CIRCUIT
- ② BUFFER MEMORY MODE CONTROLLER
- ③ REAL-TIME INPUT CIRCUIT
- ④ V.D. TO TTL CONVERTER

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COMPUTER PROJECT
BUS INDICATOR BOARD 8/77
DON McARTHUR
PAGE 2 OF 3 R.B

ELEMENT BUS



U28 (ALL 1K)



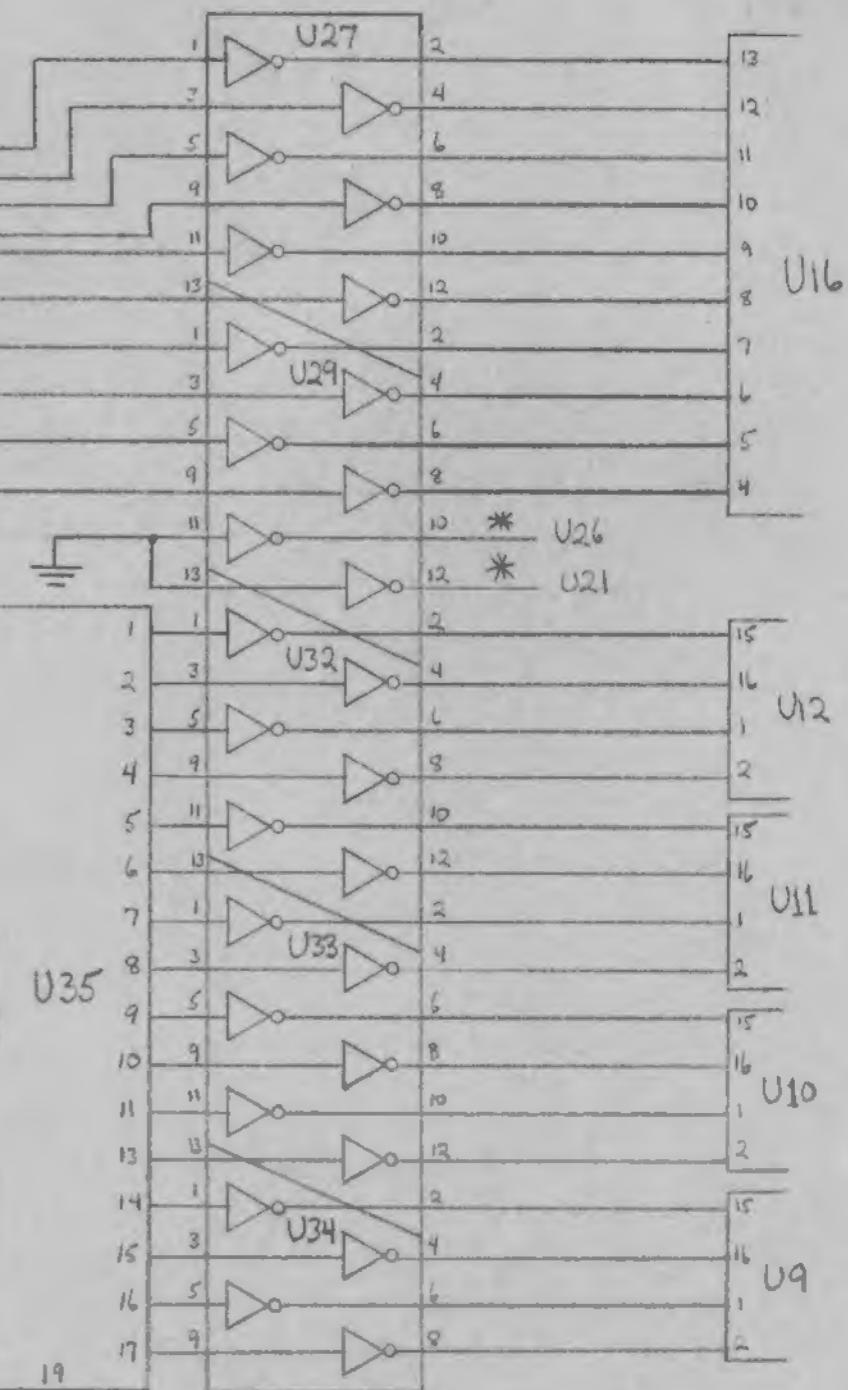
U16

U12

U11

U10

U9

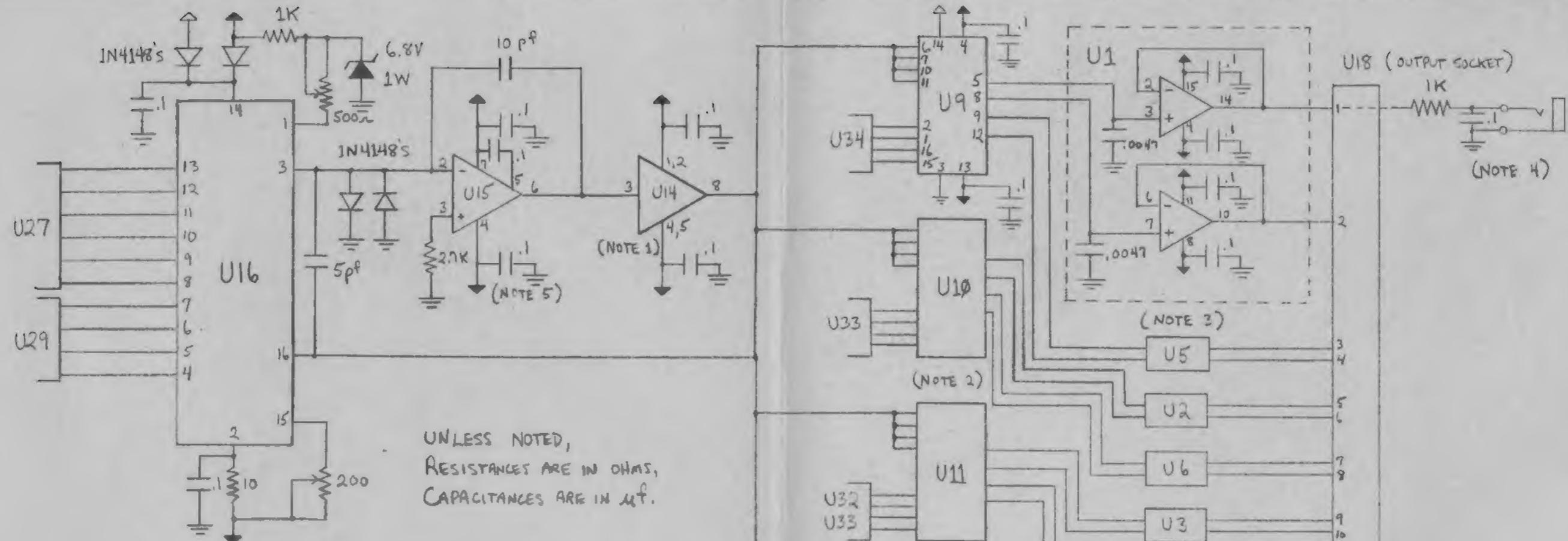


EXPERIMENTAL TV CENTER, LTD.
BINGHAMTON, N.Y. (PAGE 1 OF 4)
COMPUTER PROJECT

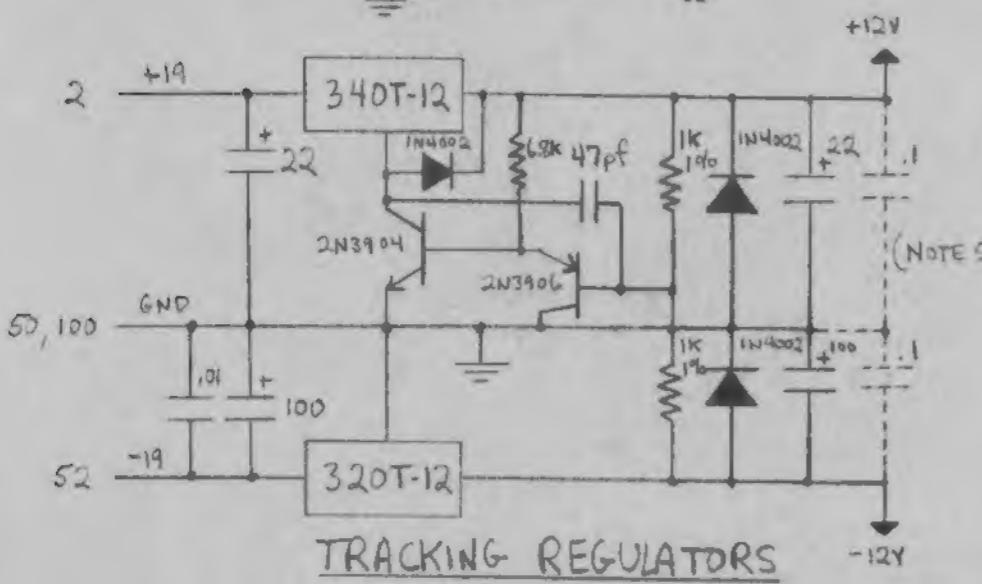
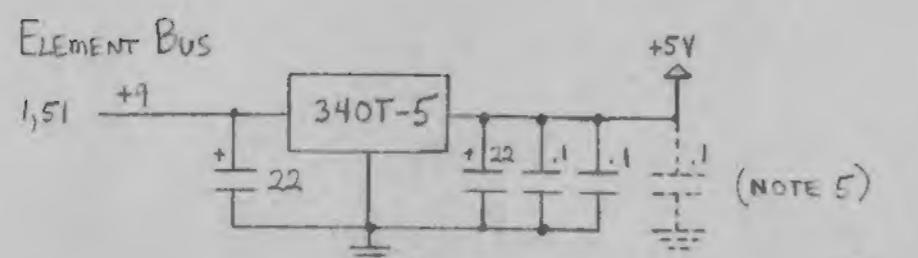
D/A BOARD, DIGITAL SECTION
DON McARTHUR 8/77 R.B.

- 1 - SET BY INTERFACE JUMPERS
- 2 - SET HERE BY U21 JUMPERS
- 3 - SELECT D/A CHANNEL HERE

170040 TO 170076



UNLESS NOTED,
RESISTANCES ARE IN OHMS
CAPACITANCES ARE IN μ F



TRACKING REGULATORS

NOTES :

- 1) U14 (LH0002CN) IS A 10-PIN DIP.
- 2) U10 - U12 ARE CONFIGURED SIMILARLY TO U.
- 3) U2 - U8 ARE CONFIGURED SIMILARLY TO U WHICH CONSISTS OF 2 LM307N CHIPS IN ONE 16-PIN SOCKET.
- 4) SEE DESCRIPTION OF D/A OUTPUT PANEL.
- 5) 1μF TANTALUM CAPACITORS ARE PLACED CLOSE TO POWER SUPPLY PINS OF ALL ANALOG CHIPS.

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BINGHAMTON, N.Y.
COMPUTER PROJECT
D/A BOARD (PAGE 2 OF 4)
ANALOG SECTION
DON McARTHUR 8/77 R.B.

PARTS LIST

1 VECTOR 8800V UNIVERSAL 100-PIN PLUG-BOARD
 26 16-PIN DIP WIRE WRAP SOCKETS
 8 14-PIN DIP " " "
 1 24-PIN DIP
 3 HEAT SINKS
 1 LM340T-5 VOLTAGE REGULATOR CHIP
 1 LM340T-12 " " "
 1 LM320T-12 " " "
 1 2N3904 TRANSISTOR (NPN)
 1 2N3906 " (PNP)
 1 IN4148 DIODES
 3 IN4002 DIODES
 1 6.8V 1 WATT ZENER DIODE
 1 SN7400N QUAD 2-INPUT NAND
 6 SN7404N HEX INVERTER
 3 SN7489N 64-BIT RAM
 1 SN74123N MONOSTABLE MULTIVIBRATOR
 1 SN74154N 4-LINE TO 16-LINE DEMULTIPLEXER
 1 SN74157N QUAD 2:1 DATA SELECTOR
 1 SN74161N BINARY COUNTER
 1 DM8131N 6-BIT UNIFIED BUS COMPARATOR
 3 DM8837N HEX UNIFIED BUS RECEIVER
 1 DAC100 10-BIT D/A
 1 LM318N HIGH SPEED OP AMP
 1 LH0002CN CURRENT AMP
 3 AH0015CD QUAD ANALOG SWITCH
 16 LM307N OP AMP

CAPACITORS

2 100 μ F 25V ELECTROLYTIC 2
 4 22 μ F 25V " 1
 1 1 μ F 50V " 1
 38 .1 μ F 35V TANTALUM 1
 1 .05 μ F DISK 1
 1 .01 μ F MYLAR 1
 16 .0047 μ F " 1
 2 .0027 μ F DISK 1
 1 47 μ F " 1
 1 10 μ F " 1
 1 500 μ F TRIMPOT 1
 1 5 μ F " 1

RESISTORS

2 1K 1/2 WATT 1% 2
 1 12K 1/4 WATT 5% 1
 1 10K " 1
 1 6.8K " 1
 1 2.7K " 1
 1 1K " 1
 1 100 Ω " 1
 1 82 Ω " 1
 1 10 Ω " 1
 1 500 Ω TRIMPOT 1
 1 200 Ω " 1

	<u>NUMBER</u>	<u>CHIP</u>	<u>LOCATION</u>	<u>+12 PIN</u>	<u>-12 PIN</u>	<u>+5 PIN</u>	<u>GND PIN</u>
	U1	2-307	AK	11,15	4,8		
	U2	2-307	AL	11,15	4,8		
	U3	2-307	AM	11,15	4,8		
	U4	2-307	AN	11,15	4,8		
	U5	2-307	BK	11,15	4,8		
	U6	2-307	BL	11,15	4,8		
	U7	2-307	BM	11,15	4,8		
	U8	2-307	BN	11,15	4,8		
	U9	AH0015	CK	4	13	14	3
	U10	AH0015	CL	4	13	14	3
	U11	AH0015	CM	4	13	14	3
	U12	AH0015	CN	4	13	14	3
	U13	OUTSOCKET	DK				
	U14	LH0002	DL	1,2	4,5		
	U15	LM318	DM	7	4		
	U16	DAC100	DN	14	2		
	U17	8837	AT			16	8
	U18	8837	AV			16	8
	U19	8837	AW			16	8
	U20	7400	AX			14	7
	U21	8131	AY			16	8
	U22	7489	BT			16	8
	U23	7489	BV			16	8
	U24	7489	BW			16	8
	U25	74157	BX			16	8
	U26	74161	BY			16	8
	U27	7404	CT			14	7
	U28	PULL-UPS	CV			16	
	U29	7404	CW			14	7
	U30	7404	CX			14	7
	U31	74123	CY			16	8
	U32	7404	DT			14	7
	U33	7404	DV			14	7
	U34	7404	DW			14	7
	U35	74154	DXY			24	12

EXPERIMENTAL TV CENTER, LTD., BINGHAMTON, N.Y.
 COMPUTER PROJECT : D/A BOARD (PAGE 3 OF 4)
 DON McARTHUR 8/77 R.B.

EXPERIMENTAL TV CENTER, LTD.
BINGHAMTON, N.Y.
COMPUTER PROJECT 9/77 R.B.
BUFFER MEMORY, PAGE 2 of 3

PARTS LIST:

1 VECTO 8800V UNIVERSAL 100-PIN PLUGBOARD
38 16-PIN DIP WIRE WRAP SOCKETS
10 14-PIN " " " "
1 24-PIN " " " "
4 HEAT SINKS
1 BERG H-854 40-PIN CONNECTOR
2 LM340T-5 REGULATOR
4 SN7400N QUAD 2-INPUT NAND
2 SN7402N QUAD 2-INPUT NOR
1 SN7404N HEX INVERTER
1 SN7404N SCHOTTKY HEX INVERTER
1 SN7430N 8-INPUT NAND
1 SN7474N DUAL D FLP FLOP
1 SN74154N 4-LINE TO 16-LINE DECODER
3 SN74157N QUAD 2:1 DATA SELECTOR
4 SN74161N ASYNCHRONOUS 4-BIT COUNTER
8 DM8097N TRI-STATE HEX BUFFER
6 N8T97N HIGH-SPEED TRI-STATE HEX BUFFER
1 DM8160N 6-BIT COMPARATOR
16 21L02 LOW POWER 1024x1 STATIC RAM
2 22uf 25V ELECTROLYTIC CAPACITORS
2 10uf 50V " "
12 .1uf 35V TANTALUM "
1 .01uf 100V MYLAR "
1 .002uf " DISK "
1 .001uf "
1 330pf " SILVER MICA "
2 51 ohm 1/4WATT RESISTORS
3 100 ohm "
3 1K "
3 10K "

NUMBER	CHIP	LOCATION	VCC PIN	GND PIN
U ₀	21L02	BC2	10	9
U ₁	21L02	CY	10	9
U ₂	21L02	CX	10	9
U ₃	21L02	CW	10	9
U ₄	21L02	CV	10	9
U ₅	21L02	CT	10	9
U ₆	21L02	CS	10	9
U ₇	21L02	CR	10	9
U ₈	21L02	BY	10	9
U ₉	21L02	BX	10	9
U ₁₀	21L02	BW	10	9
U ₁₁	21L02	BV	10	9
U ₁₂	21L02	BT	10	9
U ₁₃	21L02	BS	10	9
U ₁₄	21L02	BR	10	9
U ₁₅	21L02	BP	10	9
U ₁₆	8097	DY	16	8
U ₁₇	8097	DX	16	8
U ₁₈	8097	DW	16	8
U ₁₉	8T97	DY	16	8
U ₂₀	8T97	DT	16	8
U ₂₁	8T97	DS	16	8
U ₂₂	8097	AY	16	8
U ₂₃	8097	AX	16	8
U ₂₄	8097	AN	16	8
U ₂₅	8T97	AV	16	8
U ₂₆	8T97	AT	16	8
U ₂₇	8T97	AS	16	8
U ₂₈	74157	DR	16	8
U ₂₉	74157	DP	16	8
U ₃₀	74157	CP	16	8
U ₃₁	8160	CN	16	8
U ₃₂	7430	BN	14	7
U ₃₃	8097	AR	16	8
U ₃₄	8097	AP	16	8
U ₃₅	74161	AN	16	8
U ₃₆	74161	CM	16	8
U ₃₇	74161	BM	16	8
U ₃₈	74161	AM	16	8
U ₃₉	74154	DNM	24	12
U ₄₀	7400	DL	14	7
U ₄₁	7400	CL	14	7
U ₄₂	7400	BL	14	7
U ₄₃	7400	AL	14	7
U ₄₄	7404	DK	14	7
U ₄₅	7402	CK	14	7
U ₄₆	7402	BK	14	7
U ₄₇	74\$04	AK	14	7
U ₄₈	7474	BCJ	14	7

BERG H-854 WIRING VIEW			
SIGNAL	PIN	SIGNAL	
GND	B	A	GND
D ₁₅	D	C	D ₁₄
D ₁₃	F	E	D ₁₂
D ₁₁	J	H	D ₁₀
D ₉	L	K	D ₈
D ₇	N	M	D ₆
D ₅	R	P	D ₄
D ₃	T	S	D ₂
D ₁	V	W	D ₀
GND	X	Y	GND
A ₁₀	Z	BB	A ₉
A ₈	AA	AA	A ₇
A ₆	CC	CC	A ₅
A ₄	EE	EE	A ₃
A ₂	JJ	HH	A ₁
TT	LL	KK	S
SPARE	RR	MM	READY
GND	TT	PP	INIT
VV	SS	UU	SPARE
			GND

POWER CONSUMPTION:

+9VDC @